

WHAT IS CLAIMED IS:

1                   1.       A method of measuring a physiological parameter, comprising:  
2                   obtaining a first signal derived from electromagnetic energy transmitted  
3 through a tissue portion at a first wavelength, said first signal including a signal portion  
4 corresponding with motion-related events and a signal portion corresponding with arterial  
5 pulsation events, wherein at said first wavelength water is a dominant absorber of  
6 electromagnetic energy in the tissue portion;  
7                   obtaining a second signal derived from electromagnetic energy transmitted  
8 through a tissue portion at a second wavelength, said second signal including a signal portion  
9 corresponding with motion-related events and a signal portion corresponding with arterial  
10 pulsation events, wherein at said second wavelength hemoglobin is a dominant absorber of  
11 electromagnetic energy in the tissue portion; and  
12                   combining said first signal and said second signal to generate a combined  
13 signal comprising a plethysmograph, said combined signal having a signal portion  
14 corresponding with motion-related events that is smaller than that present in said first signal  
15 or said second signal.

1                   2.       The method of claim 1 wherein at said first wavelength water is a  
2 stronger absorber of electromagnetic energy than hemoglobin in the tissue portion.

1                   3.       The method of claim 1 wherein at said second wavelength hemoglobin  
2 is a stronger absorber of electromagnetic energy than water in the tissue portion.

1                   4.       The method of claim 1 wherein said first wavelength is in the range  
2 between approximately 900 and 1850 nm.

1                   5.       The method of claim 1 wherein said first wavelength is in the range  
2 between approximately 1100 and 1400 nm.

1                   6.       The method of claim 1 wherein said first wavelength is in the range  
2 between approximately 1150 and 1250 nm.

1                   7.       The method of claim 1 wherein said first wavelength is approximately  
2 1185 nm.

1                   8.       The method of claim 1 wherein said second wavelength is in the range  
2 between approximately 600 and 950 nm.

1                   9.       The method of claim 1 wherein said combining comprises applying a  
2 multiplier to said first signal to obtain a scaled first signal and subtracting the scaled first  
3 signal from said second signal.

1                   10.      The method of claim 9 wherein said multiplier is a function of the ratio  
2 of the absorption of electromagnetic energy in the tissue portion by hemoglobin at said first  
3 wavelength to that at said second wavelength.

1                   11.      The method of claim 1 wherein said physiological parameter is a pulse  
2 rate.

1                   12.      The method of claim 1 further comprising:  
2                   obtaining a third signal derived from electromagnetic energy transmitted  
3 through a tissue portion at a third wavelength, said third signal including a signal portion  
4 corresponding with motion-related events and a signal portion corresponding with arterial  
5 pulsation events, wherein at said third wavelength hemoglobin is a dominant absorber of  
6 electromagnetic energy in the tissue portion; and  
7                   combining said first signal and said third signal to generate a second combined  
8 signal comprising a plethysmograph, said second combined signal having a signal portion  
9 corresponding with motion-related events that is smaller than that present in said first signal  
10 or said third signal.

1                   13.      The method of claim 12 further comprising:  
2                   combining said combined signal with said second combined signal to form a  
3 combination; and  
4                   estimating an oxygen saturation value using said combination.

1                   14.      An apparatus for measuring a physiological parameter, comprising:  
2                   means for obtaining a first signal derived from electromagnetic energy  
3 transmitted through a tissue portion at a first wavelength, said first signal including a signal  
4 portion corresponding with motion-related events and a signal portion corresponding with

5 arterial pulsation events, wherein at said first wavelength water is a dominant absorber of  
6 electromagnetic energy in the tissue portion;

7 means for obtaining a second signal derived from electromagnetic energy  
8 transmitted through a tissue portion at a second wavelength, said second signal including a  
9 signal portion corresponding with motion-related events and a signal portion corresponding  
10 with arterial pulsation events, wherein at said second wavelength hemoglobin is a dominant  
11 absorber of electromagnetic energy in the tissue portion; and

12 means for combining said first signal and said second signal to generate a  
13 combined signal comprising a plethysmograph, said combined signal having a signal portion  
14 corresponding with motion-related events that is smaller than that present in said first signal  
15 or said second signal.

1 15. The apparatus of claim 14 wherein said means for obtaining a first  
2 signal comprise:

3 light emission optics configured to direct electromagnetic energy at said tissue  
4 location; and

5 light detection optics configured to receive radiation from said tissue location.

1 16. The apparatus of claim 15 wherein said light emission optics are  
2 configured to deliver electromagnetic energy at a wavelength in the range between  
3 approximately 900 and 1850 nm.

1 17. The apparatus of claim 15 wherein said light emission optics are  
2 configured to deliver electromagnetic energy at a wavelength in the range between  
3 approximately 1100 and 1400 nm.

1 18. The apparatus of claim 15 wherein said light emission optics are  
2 configured to deliver electromagnetic energy at a wavelength in the range between  
3 approximately 1150 and 1250 nm.

1 19. The apparatus of claim 15 wherein said light emission optics are  
2 configured to deliver electromagnetic energy at approximately 1185 nm.

1 20. The apparatus of claim 14 wherein said means for combining  
2 comprises means for applying a multiplier to said first signal to obtain a scaled first signal  
3 and subtracting the scaled first signal from said second signal.

1                   21.     The apparatus of claim 14 wherein said means for combining  
2 comprises a processing device configured to combine said first signal and said second signal  
3 to generate a combined signal comprising a plethysmograph, said combined signal having a  
4 signal portion corresponding with motion-related events that is smaller than that present in  
5 said first signal or said second signal.

1                   22.     The apparatus of claim 14 further comprising:  
2                   means for obtaining a third signal derived from electromagnetic energy  
3 transmitted through a tissue portion at a third wavelength, said third signal including a signal  
4 portion corresponding with motion-related events and a signal portion corresponding with  
5 arterial pulsation events, wherein at said third wavelength hemoglobin is a dominant absorber  
6 of electromagnetic energy in the tissue portion; and  
7                   means for combining said first signal and said third signal to generate a second  
8 combined signal comprising a plethysmograph, said second combined signal having a signal  
9 portion corresponding with motion-related events that is smaller than that present in said first  
10 signal or said third signal.

1                   23.     The apparatus of claim 22 further comprising:  
2                   means for combining said combined signal with said second combined signal  
3 to form a combination; and  
4                   means for estimating an oxygen saturation value using said combination.

1                   24.     The apparatus of claim 14 wherein said physiological parameter is a  
2 pulse rate.